Docket No.: YOR920030300US1
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Alfred Grill et al.

Application No.: 10/689,675 | Confirmation No.: 4901

Filed: October 22, 2003 | Art Unit: 1754

For: CONTROL OF CARBON NANOTUBE DIAMETER USING CVD OR PECVD GROWTH | Examiner: Johnson, Edward M.

DECLARATION UNDER 37 C.F.R. 1.131

MS Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Alfred Grill, Deborah Neumayer and Dinkar Singh declare that they are the coinventors of the subject matter which is claimed in U.S. Application Serial No. 10/689,675, which was filed in the United States Patent and Trademark Office on October 22, 2003; and that the inventions disclosed and claimed were conceived by us and were reduced to practice to by us and or under our direction and/or supervision prior to August 21, 2003 which is prior to the publication date of WO-2003/068676, and further states as follows:

Prior to August 21, 2003, inventions disclosed and claimed in the above U.S. Patent application were conceived by us and/or in the United States and were reduced to practice in the United States by us and/or under our direction and/or supervision.

Especially, a method for controlling the diameter of carbon nanotubes grown by chemical vapor deposition (CVD) or by plasma enhanced chemical vapor deposition(PECVD) in the range of about 0.2 to about100 nanometers was carried out. The method comprised introducing a catalyst substrate into a CVD growth reactor; increasing the growth reactor temperature to a

desired growth temperature: flowing reactive gases including a carbon containing precursor; and controlling the residence time of the carbon containing precursor in the reactor to control the diameter of the carbon nanotubes.

This is further evidenced by Exhibit A (attached hereto) which is a true copy with dates being redacted of IBM Invention Disclosure YOR8-2003-03225; Exhibit B (attached hereto) which is a true copy with dates being redacted of IBM Invention Disclosure YOR8-2003-03225, being a modified version of Exhibit A; Exhibit C (attached hereto) which is a true copy with dates being redacted of a draft for a patent application; Exhibit D (attached hereto) which is a true copy with dates being redacted of Figure 1A; Exhibit E (attached hereto) which is a true copy with dates being redacted of Figure 1B; Exhibit F (attached hereto) which is a true copy with dates being redacted of Figure 2A; and Exhibit G (attached hereto) which is a true copy with dates being redacted of Figure 2B. All of the dates that had been redacted from the above Exhibits are prior to August 21, 2003.

Exhibit C is a draft for a patent application that includes working examples that were carried out prior to August 21, 2003. Exhibits D and E show scanning electron microscope images of CNTs grown at atmospheric pressure using identical catalysts, but different gas flows. Exhibit E shows that higher gas flow results in relatively thin tubes, while Exhibit D shows that lower gas flows in result in relatively thick tubes. Exhibits F and G illustrate the effects of growth pressure on CNT diameter. Exhibit F shows a scanning electron micrograph of CNTs grown at 80 torr, while Exhibit G shows an atomic force microscopy image of CNTs grown at 40 torr using identical catalysts (2mm thick Fe film) and gas flows.

The undersigned further declares that all statements made herein of our own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful, false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: 3/13/2009 Alfred Grill

Date: 3/13/2009 Deborah Neumayer

Date: Dinkar Singh